



SEQUENCE LISTING

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Wang, Yubao
Gefu, Wang-Pruski

<120> Method for Studying Protein Interactions in Vivo

<130> 11785-3

<140> US 09/786377

<141> 1999-09-02

<150> US 60/135,835

<151> 1999-05-24

<150> US 60/099,068

<151> 1998-09-03

<150> PCT/US99/20207

<151> 1999-09-02

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<170> PatentIn version 3.0

<210> 1

<211> 918

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<213> Homo sapiens

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ctg ctc gct gcc agc cca gga ggc gcc ttg gcg cgg tgc cca ggc tgc 95

Leu Leu Ala Ala Ser Pro Gly Gly Ala Leu Ala Arg Cys Pro Gly Cys

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ggg caa ggg gtg cag gcg ggt tgt cca ggg ggc tgc gtg gag gag gag 143

Gly Gln Gly Val Gln Ala Gly Cys Pro Gly Gly Cys Val Glu Glu Glu

35 40 45

gat ggg ggg tcg cca gcc gag ggc tgc gcg gaa gct gag ggc tgt ctc 191

Asp Gly Gly Ser Pro Ala Glu Gly Cys Ala Glu Ala Glu Gly Cys Leu

50 55 60

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agg agg gag ggg cag gag tgc ggg gtc tac acc cct aac tgc gcc cca 239
 Arg Arg Glu Gly Gln Glu Cys Gly Val Tyr Thr Pro Asn Cys Ala Pro
 65 70 75

gga ctg cag tgc cat ccg ccc aag gac gac gag gcg cct ttg cgg gcg 287
 Gly Leu Gln Cys His Pro Pro Lys Asp Asp Glu Ala Pro Leu Arg Ala
 80 85 90 95

ctg ctg ctc ggc cga ggc cgc tgc ctt ccg gcc cgc gcg cct gct gtt 335
 Leu Leu Leu Gly Arg Gly Arg Cys Leu Pro Ala Arg Ala Pro Ala Val
 100 105 110

gca gag gag aat cct aag gag agt aaa ccc caa gca ggc act gcc cgc 383
 Ala Glu Glu Asn Pro Lys Glu Ser Lys Pro Gln Ala Gly Thr Ala Arg
 115 120 125

cca cag gat gtg aac cgc aga gac caa cag agg aat cca ggc acc tct 431
 Pro Gln Asp Val Asn Arg Arg Asp Gln Gln Arg Asn Pro Gly Thr Ser
 130 135 140

acc acg ccc tcc cag ccc aat tct gcg ggt gtc caa gac act gag atg 479
 Thr Thr Pro Ser Gln Pro Asn Ser Ala Gly Val Gln Asp Thr Glu Met
 145 150 155

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 Gly Pro Cys Arg Arg His Leu Asp Ser Val Leu Gln Gln Leu Gln Thr
 160 165 170 175

gag gtc tac cga ggg gct caa aca ctc tac gtg ccc aat tgt gac cat 575
 Glu Val Tyr Arg Gly Ala Gln Thr Leu Tyr Val Pro Asn Cys Asp His
 180 185 190

cga ggc ttc tac cgg aag cgg cag tgc cgc tcc tcc cag ggg cag cgc 623
 Arg Gly Phe Tyr Arg Lys Arg Gln Cys Arg Ser Ser Gln Gly Gln Arg
 195 200 205

cga ggt ccc tgc tgg tgt gtg gat cgg atg ggc aag tcc ctg cca ggg 671
 Arg Gly Pro Cys Trp Cys Val Asp Arg Met Gly Lys Ser Leu Pro Gly
 210 215 220

tct cca gat ggc aat gga agc tcc tcc tgc ccc act ggg agt agc ggc 719
 Ser Pro Asp Gly Asn Gly Ser Ser Ser Cys Pro Thr Gly Ser Ser Gly
 225 230 235

taaagctggg ggatagaggg gctgcagggc cactggaagg aacatggagc tgtcatcact
 779

caacaaaaaa ccgaggccct caatccacct tcaggccccg ccccatgggc ccctcaccgc
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Gly Gly Ser Pro Ala Glu Gly Cys Ala Glu Ala Glu Gly Cys Leu Arg
50 55 60
Arg Glu Gly Gln Glu Cys Gly Val Tyr Thr Pro Asn Cys Ala Pro Gly
65 70 75 80
Leu Gln Cys His Pro Pro Lys Asp Asp Glu Ala Pro Leu Arg Ala Leu
85 90 95
Leu Leu Gly Arg Gly Arg Cys Leu Pro Ala Arg Ala Pro Ala Val Ala
100 105 110
Glu Glu Asn Pro Lys Glu Ser Lys Pro Gln Ala Gly Thr Ala Arg Pro
115 120 125
Gln Asp Val Asn Arg Arg Asp Gln Gln Arg Asn Pro Gly Thr Ser Thr
130 135 140
Thr Pro Ser Gln Pro Asn Ser Ala Gly Val Gln Asp Thr Glu Met Gly
145 150 155 160
Pro Cys Arg Arg His Leu Asp Ser Val Leu Gln Gln Leu Gln Thr Glu
165 170 175
Val Tyr Arg Gly Ala Gln Thr Leu Tyr Val Pro Asn Cys Asp His Arg
180 185 190
Gly Phe Tyr Arg Lys Arg Gln Cys Arg Ser Ser Gln Gly Gln Arg Arg
195 200 205
Gly Pro Cys Trp Cys Val Asp Arg Met Gly Lys Ser Leu Pro Gly Ser
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Ile Thr Gly Pro Gln Trp Trp Ala Arg Cys Lys Gln Met Asn Val Leu
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gat tca ttt att aat tat tat gat tca gaa aaa cat gca gaa aat gct 147
Asp Ser Phe Ile Asn Tyr Tyr Asp Ser Glu Lys His Ala Glu Asn Ala
35 40 45

gtt att ttt tta cat ggt aac gcg gcc tct tct tat tta tgg cga cat 195
Val Ile Phe Leu His Gly Asn Ala Ala Ser Ser Tyr Leu Trp Arg His
50 55 60

gtt gtg cca cat att gag cca gta gcg cgg tgt att ata cca gat ctt 243
Val Val Pro His Ile Glu Pro Val Ala Arg Cys Ile Ile Pro Asp Leu
65 70 75

att ggt atg ggc aaa tca ggc aaa tct ggt aat ggt tct tat agg tta 291
Ile Gly Met Gly Lys Ser Gly Lys Ser Gly Asn Gly Ser Tyr Arg Leu
80 85 90

ctt gat cat tac aaa tat ctt act gca tgg ttt gaa ctt ctt aat tta 339
Leu Asp His Tyr Lys Tyr Leu Thr Ala Trp Phe Glu Leu Leu Asn Leu
95 100 105 110

cca aag aag atc att ttt gtc ggc cat gat tgg ggt gct tgt ttg gca 387
Pro Lys Lys Ile Ile Phe Val Gly His Asp Trp Gly Ala Cys Leu Ala
115 120 125

ttt cat tat agc tat gag cat caa gat aag atc aaa gca ata gtt cac 435
Phe His Tyr Ser Tyr Glu His Gln Asp Lys Ile Lys Ala Ile Val His
130 135 140

gct gaa agt gta gta gat gtg att gaa tca tgg gat gaa tgg cct gat 483
Ala Glu Ser Val Val Asp Val Ile Glu Ser Trp Asp Glu Trp Pro Asp
145 150 155

att gaa gaa gat att gcg ttg atc aaa tct gaa gaa gga gaa aaa atg 531
Ile Glu Glu Asp Ile Ala Leu Ile Lys Ser Glu Glu Gly Glu Lys Met
160 165 170

gtt ttg gag aat aac ttc ttc gtg gaa acc atg ttg cca tca aaa atc 579
 Val Leu Glu Asn Asn Phe Phe Val Glu Thr Met Leu Pro Ser Lys Ile
 175 180 185 190

atg aga aag tta gaa cca gaa gaa ttt gca gca tat ctt gaa cca ttc 627
 Met Arg Lys Leu Glu Pro Glu Glu Phe Ala Ala Tyr Leu Glu Pro Phe
 195 200 205

aaa gag aaa ggt gaa gtt cgt cgt cca aca tta tca tgg cct cgt gaa 675
 Lys Glu Lys Gly Glu Val Arg Arg Pro Thr Leu Ser Trp Pro Arg Glu
 210 215 220

atc ccg tta gta aaa ggt ggt aaa cct gac gtt gta caa att gtt agg 723
 Ile Pro Leu Val Lys Gly Gly Lys Pro Asp Val Val Gln Ile Val Arg
 225 230 235

aat tat aat gct tat cta cgt gca agt gat gat tta cca aaa atg ttt 771
 Asn Tyr Asn Ala Tyr Leu Arg Ala Ser Asp Asp Leu Pro Lys Met Phe
 240 245 250

att gaa tcg gat cca gga ttc ttt tcc aat gct att gtt gaa ggc gcc 819
 Ile Glu Ser Asp Pro Gly Phe Phe Ser Asn Ala Ile Val Glu Gly Ala
 255 260 265 270

aag aag ttt cct aat act gaa ttt gtc aaa gta aaa ggt ctt cat ttt 867
 Lys Lys Phe Pro Asn Thr Glu Phe Val Lys Val Lys Gly Leu His Phe
 275 280 285

tcg caa gaa gat gca cct gat gaa atg gga aaa tat atc aaa tcg ttc 915
 Ser Gln Glu Asp Ala Pro Asp Glu Met Gly Lys Tyr Ile Lys Ser Phe
 290 295 300

gtt gag cga gtt ctc aaa aat gaa caa taa ttactttggt tttttattta 965
 Val Glu Arg Val Leu Lys Asn Glu Gln
 305 310

catttttccc gggtttaata atataaatgt cattttcaac aattttattt taactgaata 1025

tttcacaggg aacattcata tatgttgatt aatttagctc gaactttact ctgtcatatc 1085

attttggaat attacctctt tcaatgaaac tttataaaca gtggttcaat taattaatat 1145

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	50				55					60						
Pro	His	Ile	Glu	Pro	Val	Ala	Arg	Cys	Ile	Ile	Pro	Asp	Leu	Ile	Gly	
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Met	Gly	Lys	Ser	Gly	Lys	Ser	Gly	Asn	Gly	Ser	Tyr	Arg	Leu	Leu	Asp	
			85					90					95			
His	Tyr	Lys	Tyr	Leu	Thr	Ala	Trp	Phe	Glu	Leu	Leu	Asn	Leu	Pro	Lys	
		100					105					110				
Lys	Ile	Ile	Phe	Val	Gly	His	Asp	Trp	Gly	Ala	Cys	Leu	Ala	Phe	His	
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Tyr	Ser	Tyr	Glu	His	Gln	Asp	Lys	Ile	Lys	Ala	Ile	Val	His	Ala	Glu	
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Ser	Val	Val	Asp	Val	Ile	Glu	Ser	Trp	Asp	Glu	Trp	Pro	Asp	Ile	Glu	
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Glu	Asp	Ile	Ala	Leu	Ile	Lys	Ser	Glu	Glu	Gly	Glu	Lys	Met	Val	Leu	
			165					170				175				
Glu	Asn	Asn	Phe	Phe	Val	Glu	Thr	Met	Leu	Pro	Ser	Lys	Ile	Met	Arg	
		180					185					190				
Lys	Leu	Glu	Pro	Glu	Glu	Phe	Ala	Ala	Tyr	Leu	Glu	Pro	Phe	Lys	Glu	
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Lys	Gly	Glu	Val	Arg	Arg	Pro	Thr	Leu	Ser	Trp	Pro	Arg	Glu	Ile	Pro	
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Asn	Ala	Tyr	Leu	Arg	Ala	Ser	Asp	Asp	Leu	Pro	Lys	Met	Phe	Ile	Glu	
			245				250					255				
Ser	Asp	Pro	Gly	Phe	Phe	Ser	Asn	Ala	Ile	Val	Glu	Gly	Ala	Lys	Lys	
		260					265					270				
Phe	Pro	Asn	Thr	Glu	Phe	Val	Lys	Val	Lys	Gly	Leu	His	Phe	Ser	Gln	
		275				280					285					
Glu	Asp	Ala	Pro	Asp	Glu	Met	Gly	Lys	Tyr	Ile	Lys	Ser	Phe	Val	Glu	
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Arg Val Leu Lys Asn Glu Gln
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gcc ttc gcc tcg tgc tgc att gct gct tac cgc ccc agt gag acc ctg	96
Ala Phe Ala Ser Cys Cys Ile Ala Ala Tyr Arg Pro Ser Glu Thr Leu	
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tgc ggc ggg gag ctg gtg gac acc ctc cag ttc gtc tgt ggg gac cgc	144
Cys Gly Gly Glu Leu Val Asp Thr Leu Gln Phe Val Cys Gly Asp Arg	
35 40 45	
ggc ttc tac ttc agc agg ccc gca agc cgt gtg agc cgt cgc agc cgt	192
Gly Phe Tyr Phe Ser Arg Pro Ala Ser Arg Val Ser Arg Arg Ser Arg	
50 55 60	
ggc atc gtt gag gag tgc tgt ttc cgc agc tgt gac ctg gcc ctc ctg	240
Gly Ile Val Glu Glu Cys Cys Phe Arg Ser Cys Asp Leu Ala Leu Leu	
65 70 75 80	
gag acg tac tgt gct acc ccc gcc aag tcc gag agg gac gtg tcg acc	288
Glu Thr Tyr Cys Ala Thr Pro Ala Lys Ser Glu Arg Asp Val Ser Thr	
85 90 95	
cct ccg acc gtg ctt ccg gac aac ttc ccc aga tac ccc gtg ggc aag	336
Pro Pro Thr Val Leu Pro Asp Asn Phe Pro Arg Tyr Pro Val Gly Lys	
100 105 110	
ttc ttc caa tat gac acc tgg aag cag tcc acc cag cgc ctg cgc agg	384
Phe Phe Gln Tyr Asp Thr Trp Lys Gln Ser Thr Gln Arg Leu Arg Arg	
115 120 125	
ggc ctg cct gcc ctc ctg cgt gcc cgc cgg ggt cac gtg ctc gcc aag	432
Gly Leu Pro Ala Leu Leu Arg Ala Arg Arg Gly His Val Leu Ala Lys	
130 135 140	
gag ctc gag gcg ttc agg gag gcc aaa cgt cac cgt ccc ctg att gct	480
Glu Leu Glu Ala Phe Arg Glu Ala Lys Arg His Arg Pro Leu Ile Ala	
145 150 155 160	

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 Ser Asn Arg Lys
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 35 40 45
 Gly Phe Tyr Phe Ser Arg Pro Ala Ser Arg Val Ser Arg Arg Ser Arg
 50 55 60
 Gly Ile Val Glu Glu Cys Cys Phe Arg Ser Cys Asp Leu Ala Leu Leu
 65 70 75 80
 Glu Thr Tyr Cys Ala Thr Pro Ala Lys Ser Glu Arg Asp Val Ser Thr
 85 90 95
 Pro Pro Thr Val Leu Pro Asp Asn Phe Pro Arg Tyr Pro Val Gly Lys
 100 105 110
 Phe Phe Gln Tyr Asp Thr Trp Lys Gln Ser Thr Gln Arg Leu Arg Arg
 115 120 125
 Gly Leu Pro Ala Leu Leu Arg Ala Arg Arg Gly His Val Leu Ala Lys
 130 135 140
 Glu Leu Glu Ala Phe Arg Glu Ala Lys Arg His Arg Pro Leu Ile Ala
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 Leu Pro Thr Gln Asp Pro Ala His Gly Gly Ala Pro Pro Glu Met Ala
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 Ser Asn Arg Lys
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1			5						10					15		

gaa	ctg	gat	ggc	gat	gtg	aat	ggg	cac	aaa	ttt	tct	gtc	agc	gga	gag	96
Glu	Leu	Asp	Gly	Asp	Val	Asn	Gly	His	Lys	Phe	Ser	Val	Ser	Gly	Glu	
		20					25					30				

ggt	gaa	ggt	gat	gcc	aca	tac	gga	aag	ctc	acc	ctg	aaa	ttc	atc	tgc	144
Gly	Glu	Gly	Asp	Ala	Thr	Tyr	Gly	Lys	Leu	Thr	Leu	Lys	Phe	Ile	Cys	
	35					40					45					

acc	act	gga	aag	ctc	cct	gtg	cca	tgg	cca	aca	ctg	gtc	act	acc	ttc	192
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Ser	Tyr	Gly	Val	Gln	Cys	Phe	Ser	Arg	Tyr	Pro	Asp	His	Met	Lys	Gln	
65				70						75					80	

cat	gac	ttt	ttc	aag	agc	gcc	atg	ccc	gag	ggc	tat	gtg	cag	gag	aga	288
His	Asp	Phe	Phe	Lys	Ser	Ala	Met	Pro	Glu	Gly	Tyr	Val	Gln	Glu	Arg	
		85					90					95				

acc	atc	ttt	ttc	aaa	gat	gac	ggg	aac	tac	aag	acc	cgc	gct	gaa	gtc	336
Thr	Ile	Phe	Phe	Lys	Asp	Asp	Gly	Asn	Tyr	Lys	Thr	Arg	Ala	Glu	Val	
		100					105					110				

aag	ttc	gaa	ggt	gac	acc	ctg	gtg	aat	aga	atc	gag	ctg	aag	ggc	att	384
Lys	Phe	Glu	Gly	Asp	Thr	Leu	Val	Asn	Arg	Ile	Glu	Leu	Lys	Gly	Ile	
	115					120					125					

gac	ttt	aag	gag	gat	gga	aac	att	ctc	ggc	cac	aag	ctg	gaa	tac	aac	432
Asp	Phe	Lys	Glu	Asp	Gly	Asn	Ile	Leu	Gly	His	Lys	Leu	Glu	Tyr	Asn	
	130				135				140							

tat	aac	tcc	cac	aat	gtg	tac	atc	atg	gcc	gac	aag	caa	aag	aat	ggc	480
Tyr	Asn	Ser	His	Asn	Val	Tyr	Ile	Met	Ala	Asp	Lys	Gln	Lys	Asn	Gly	
145					150				155						160	

atc	aag	gtc	aac	ttc	aag	atc	aga	cac	aac	att	gag	gat	gga	tcc	gtg	528
Ile	Lys	Val	Asn	Phe	Lys	Ile	Arg	His	Asn	Ile	Glu	Asp	Gly	Ser	Val	

165						170						175						
cag	ctg	gcc	gac	cat	tat	caa	cag	aac	act	cca	atc	ggc	gac	ggc	cct	576		
Gln	Leu	Ala	Asp	His	Tyr	Gln	Gln	Asn	Thr	Pro	Ile	Gly	Asp	Gly	Pro			
180						185						190						
gtg	ctc	ctc	cca	gac	aac	cat	tac	ctg	tcc	acc	cag	tct	gcc	ctg	tct	624		
Val	Leu	Leu	Pro	Asp	Asn	His	Tyr	Leu	Ser	Thr	Gln	Ser	Ala	Leu	Ser			
195						200						205						
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Lys	Asp	Pro	Asn	Glu	Lys	Arg	Asp	His	Met	Val	Leu	Leu	Glu	Phe	Val			
210						215						220						
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		20					25					30			
Gly	Glu	Gly	Asp	Ala	Thr	Tyr	Gly	Lys	Leu	Thr	Leu	Lys	Phe	Ile	Cys
	35					40					45				
Thr	Thr	Gly	Lys	Leu	Pro	Val	Pro	Trp	Pro	Thr	Leu	Val	Thr	Thr	Phe
	50				55					60					
Ser	Tyr	Gly	Val	Gln	Cys	Phe	Ser	Arg	Tyr	Pro	Asp	His	Met	Lys	Gln
65					70					75				80	
His	Asp	Phe	Phe	Lys	Ser	Ala	Met	Pro	Glu	Gly	Tyr	Val	Gln	Glu	Arg
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Thr	Ile	Phe	Phe	Lys	Asp	Asp	Gly	Asn	Tyr	Lys	Thr	Arg	Ala	Glu	Val
	100						105					110			
Lys	Phe	Glu	Gly	Asp	Thr	Leu	Val	Asn	Arg	Ile	Glu	Leu	Lys	Gly	Ile
	115					120					125				
Asp	Phe	Lys	Glu	Asp	Gly	Asn	Ile	Leu	Gly	His	Lys	Leu	Glu	Tyr	Asn
130					135				140						
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105

110

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<213> Homo sapiens

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Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe
35 40 45

Phe Tyr Thr Pro Lys Thr Arg Arg Glu Ala Glu Asp Leu Gln Val Gly
50 55 60

Gln Val Glu Leu Gly Gly Gly Pro Gly Ala Gly Ser Leu Gln Pro Leu
65 70 75 80

Ala Leu Glu Gly Ser Leu Gln Lys Arg Gly Ile Val Glu Gln Cys Cys
85 90 95

Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Asn
100 105 110